A Comprehensive Investigation into Full-Scale Characteristics Contributing to Seafarers' Psychological Security: Egyptian Seafarers as a Case Study

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المستخلص

لطالما كانت الصحة النفسية للبحارة مصدر قلق رئيسي للمشاركين في صناعة الشحن. فهي تلعب دورًا محوريًا في تمكين البحارة من التعامل مع القلق والخوف على متن السفينة، مع الوقاية من الأخطاء البشرية المكلفة. علاوة على ذلك، فإن تحقيق الأمان النفسي أمر أساسي للبحارة للتكيف مع بيئتهم وأداء واجباتهم على متن السفينة بكفاءة. يهدف هذا البحث إلى تقييم الأمان النفسي للبحارة فيما يتعلق بعوامل ديموغرافية متنوعة. لتحقيق ذلك، تم تطوير مقياس الأمان النفسي (PSS) ثم تم تطبيقه على ٢٤٨ بحارًا مصريًا. من خلال التحليل الكمي الدقيق للبيانات المجمعة، كشفت الدراسة أن العوامل المتعلقة ببيئة العمل والتفاعلات مع الزملاء كانت أكثر تأثيرًا في تحديد الأمان النفسي مقارنة بالجوانب المتعلقة بالعائلة، حيث كانت تفسر ٢٨٪ من التباين (R2=28%) ومن اللافت أن البحارة الذين شعروا بالرضا في تلبية احتياجاتهم الفسيولوجية على متن السفينة أظهروا أمانًا نفسيًا مرتفعًا. تشمل العوامل الأخرى التي تعزز الأمان النفسي التواصل المنتظم مع العائلة، والتفاعلات الاجتماعية القوية مع أفراد الطاقم، والالتزام بجدول تغيير الطاقم، والرضا عن الراتب، والمشاركة في التمارين البدنية.

Abstract

The mental health of seafarers has long been a major concern for maritime industry stakeholders. It plays a pivotal role in enabling seafarers to cope with onboard anxiety and fear, while preventing costly human errors. Moreover, achieving psychological security is fundamental for seafarers to adapt to their environment and competently fulfil their duties onboard. This research aims to evaluate the psychological security of seafarers in relation to various demographic factors. To achieve this, a novel Psychological Security Scale (PSS) was developed then administered to 248 Egyptian seafarers. Through rigorous quantitative analysis of the collected data, the study revealed that factors related to the work environment and interactions with colleagues were more influential in determining psychological security than family-related aspects, accounting for 28% of the variance (R2=28%). Notably, seafarers who experienced satisfaction in meeting their physiological needs onboard exhibited heightened psychological security. Other factors bolstering psychological security included regular family communication, robust social interactions with crew members, adherence to a scheduled crew change, salary satisfaction, and engagement in physical workouts.

Keywords: Psychological Security, Maritime Safety, Seafarers, Human Factors. Crew Health, Well-being, Mental Health

Introduction

The International Maritime Organisation (IMO) has emphasized seafarers' wellbeing and psychological security in the revised version of the STCW (IMO, 2023a). Recognizing the vital role of psychological safety in enhancing seafarers' performance, the Subcommittee on Human Element, Training and Watchkeeping (HTW 9) convened in February 2023. The session focused on the importance of psychological safety for seafarers and expressed support for developing a standalone competence in Section A-VI/1 and Table A-VI/1-4 of the STCW Convention and Code (ABS, 2023; LISCR, 2023). However, this concept has not yet been officially incorporated into the STCW instruments (Safety4Sea, 2023).

Numerous research studies found in the literature focus on the psychological aspects of seafarers. Iversen (2012a) indicated that the working conditions for seafarers affect them psychologically in a severe way. They may suffer from anxiety and depression, probably leading ultimately to suicide. Seafarers spend long periods of time away from their homes and families. They are so often than not liable to constant stress and may not get enough sleep as they are sometimes exposed to accidents, piracy, and other risks.

Among the foremost psychological phenomena that should be considered is the psychological security especially for maritime. The American humanistic psychologist Abraham Maslow was the first one to identify the concept of security as the feeling of safety and freedom from fear and anxiety, leading the person' meeting of their different needs at present and future. Insecurity was defined as the feeling of expecting danger or risk (Maslow et al., 1945a). In Maslow's hierarchical theory of human needs shown in Figure 9, the security need is so basic as it is hard for humans to survive when this need is not sufficiently satisfied. Maslow et al (1945a) have also confirmed that people who are psychologically insecure are considered a threat to the world, because they tend to see it as insecure.

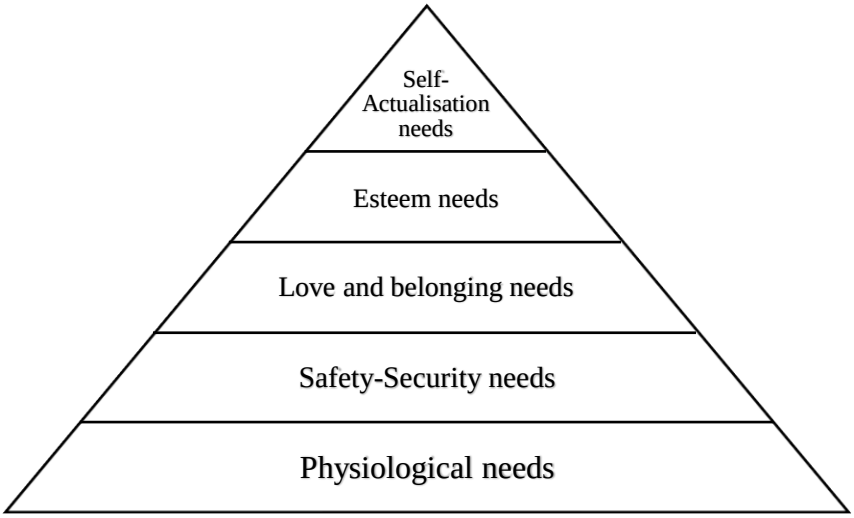

Figure 9: Maslow hierarchy of human needs, adopted from (Maslow, 1943a)

The inherent risks in seafaring can compromise both ship safety and crew wellbeing, and these hazards are exacerbated if a seafarer is psychologically unstable. Despite the potential consequences, research has often neglected seafarers' psychological safety, with past studies prioritizing the enhancement of seafarers' welfare over an examination of risks to their mental health.

Working at sea requires high safety and security. Any drop in performance, whether from mental health or other issues, jeopardizes everyone on board. As Carter (2005) notes, safety and security are interlinked; both are vital. However, they differ safety involves accidental harm, security intentional harm. If security declines, safety follows, raising risks. So, safety and security tie directly to psychological wellbeing, and inversely to risk level (Cusimano & Byres, 2010).

Psychological safety refers to an environment where individuals feel at ease expressing themselves without fear of ridicule or blame (Edmondson, 2018). On the other hand, psychological security is an individual's sense of safety, control, and self-assurance in various contexts, encompassing feelings of fulfilment and belonging (Chen & Zha, 2018). These concepts are complementary and interdependent, contributing to overall psychological wellbeing (Zotova & Karapetyan, 2018). As indicated by seminal works such as those by Maslow (1954), Ryff & Keyes (1995), and Ryan & Deci (2000), the need for security is a universal human requirement, and its attainment has positive implications for both individuals and society at large.

A study by Graham, (2009) has been concerned with the serious consequences on the welfare of seafarers. The study assured the importance of considering the humanity of seafarers for attaining harmonization between welfare and security. Iversen, (2012b) has reviewed published and unpublished information on the mental health of seafarers. Based on the review of recent literature on the mental health of seafarers and the acquired published statistics over a fifty-year time span, the study stressed the need on the part of all those involved in the international maritime shipping industry to consider the role of mental health of seafarers. Improving mental health of seafarers was demonstrated to ensure the decline of depression, death and suicide resulting from the lack of security. Hystad et al., (2013) investigated the mental fatigue undergone by seafarers working in the offshore oil and gas industry due to the defective safety climate psychological work environment as well as shift management. Based on the study, aspects of the psychological work environment and safety climate were stressed to be the foremost factors affecting fatigue and safety, and that therefore require considerable attention.

Afolabi & Balogun, (2017) focused on the effects of psychological security, emotional intelligence as well as self-efficacy regarding life satisfaction. Psychological security, emotional intelligence and self-efficacy were assured to be the basic factors implicating life satisfaction. Also, the study suggested organizing psycho-educational interventions for promoting psychological security and enhancing emotional intelligence and self-efficacy. Seeking to discern the safety climate of individuals working at sea in Norwegian maritime companies, a study by Mallam et al., (2019)

involved an online safety climate questionnaire on the issue. Obtained results have assured the lower perceptions of safety within organizations and for certified seafarers. That was mainly due to the extensive restrictions and the excessive maritime safety education and training seafarers often undergo. To determine the effect of different individual and occupational factors on psychological well-being and job satisfaction among merchant seafarers. McVeigh et al., (2019) conducted secondary data analysis administered by a large shipping company to seafarers. Based on the study, supportive, equal, and just-work environment was assured to be the foremost factor upon which the psychological well-being of seafarers primarily depends.

Grimm et al., (2020) investigated the interrelationship between cohesion, authentic leadership, and psychological safety in the maritime industry. The quantitative research has shown that authentic leadership is a crucial indication of psychological safety in the maritime industry. Further, the study ascertained the strong connection between psychological security and high-quality interpersonal relationships as well as effective leadership. Rahmoun & Said Essa, (2022) introduced an analysis for the possibility of integrating psychological security into safety critical operations, bridge teamwork as well as the requirements for seafarers. Comparing the application of psychological safety in different security critical domains with the Bridge Resource Management (BRM) required by STCW, the study recommended the practice of psychological safety practically for improving BRM training. Brooks & Greenberg, (2022) conducted a systematic survey concerning the essential factors closely intertwined with mental health and well-being in maritime personnel. They recommended boosting the wellbeing of maritime staff via improving mental health based on providing education, support as well as promoting crew members.

The quoted studies reflect on the importance of psychological security in the maritime industry broadly. Psychological security in the context of leadership and teamwork allies with relevant psychological theories, such as Maslow's Hierarchy of Needs (Maslow, 1943) and self-determination theory (Ryan & Deci, 2000). Grimm et al. (2020) advocate for the part played by leadership and cohesion, reiterating Maslow's assertion that social belongingness and security are basal human needs that help them perform professionally. Rahmoun & Said Essa (2022) also advocated for instilling psychological safety in safety-critical maritime operations, which is further explained in theories that suggest such types of detailed performance made by human beings when they function in an environment with wide-open communication and trust (Edmondson, 2018).

Moreover, Brooks & Greenberg (2022) talk about the relationship mentally between workplace well-being and mental health; the similarity emphasized by self-determination theory is autonomy, competence, and relatedness being motivational and satisfaction-laden aspects. Toward these lines, one can take psychological security not just a consequence of the conducive conditions as it happens to be a determining activity along with safety culture and productivity effectiveness in maritime environments.

The present study builds on these theoretical foundations through a broader perspective towards demographic and work-related factors influencing psychological security. Previous research has

indeed looked into psychological safety in leadership and operational contexts, but the current research takes this deeper into the environmental influences-family, colleagues, and work conditions to develop a very holistic understanding of seafarers' psychological security. This will be the foundation for any worthwhile improvement concerning seafarers' general well-being and the safety culture of the overall industry.

Upon reviewing the existing literature, it becomes evident that there is a notable scarcity of studies specifically addressing the issue of psychological security among seafarers. This does not, however, diminish the interest of researchers in this topic across various fields outside of maritime studies. By fostering an environment that supports the psychological security of seafarers, we create a workspace that encourages openness, tolerates mistakes, and promotes their acknowledgment without fear or hesitation. This not only benefits the seafarers but also enhances the overall functioning of the ship.

As Edmondson (2018) highlighted, a psychologically safe work environment that allows team members to voice their thoughts openly enhances team efficiency and productivity while reducing errors. This ultimately results in significant gains for the organization. Despite these insights, there remains a gap in published research investigating the safety levels of seafarers. Therefore, it is apparent that in regard to the psychological security factor, there exists a scarcity of research studies that have concentrated on the matter with respect to seafarers.

Research objectives

From the literature review, it's clear that research addressing the psychological security of seafarers is scarce, despite its importance in reducing human error in the maritime field. This study represents an initial step in exploring this area, focusing on the analysis of three vital environments surrounding seafarers: family characteristics, work, and colleagues' environment. The primary objective was to identify factors within these environments that may influence psychological security and determine their significance.

Additionally, the study aimed to develop a new scale based on Maslow's S-I Inventory to achieve these research objectives and to uncover which of these environments would have the most substantial impact on explaining psychological security.

Methodology and Demographic Analysis

The methodology for this study was developed following an extensive review of literature on psychological security, with a particular focus on the seafaring context. This review guided the identification of three key environments - personal characteristics, family characteristics, and work and colleagues' environment - and their respective factors that may influence seafarers' psychological security.

Building on Maslow's dimensions and Maslow's S-I Inventory, we crafted a comprehensive scale tailored to the unique circumstances of seafarers' work. This scale prioritizes behavioural attitudes over self-report statements to minimize the impact of social desirability bias.

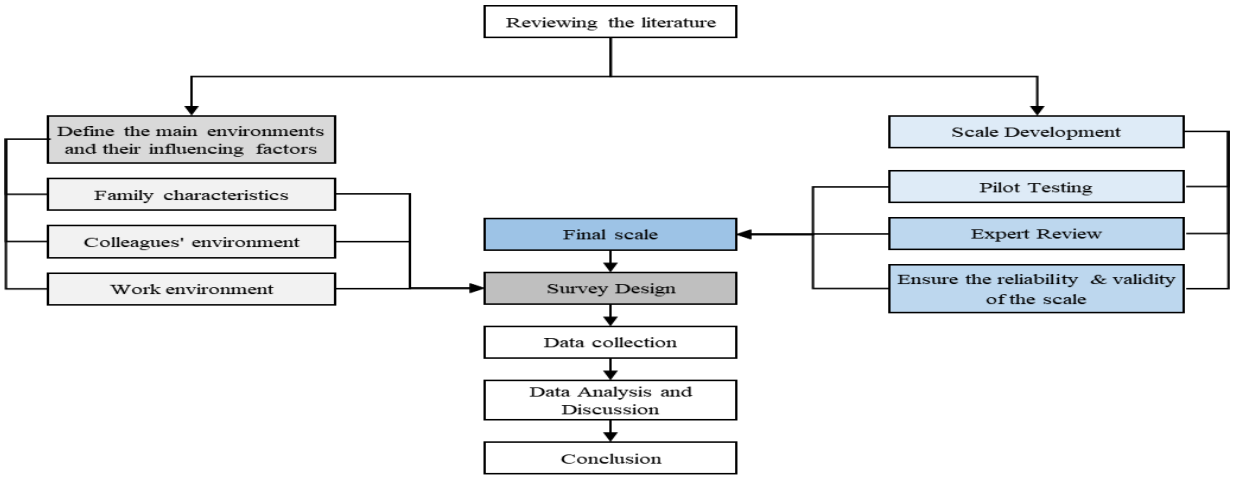

Figure 10: Methodology and Demographic Analysis research framework

The data collection method was through an online survey designed for the study sample as shared with different shipping and maritime unions and professional networks for maximum engagement to participate in the exercise. The survey was anonymous and had structured followed by open-ended questions directed at assessing psychologically secure seafarers comprehensively. A total of 248 completely responded surveys were obtained from Egyptian seafarers to create a dataset for further analysis. The sample consisted of seafarers with different ranks, types of vessels, and experience levels to ensure representivity from the workforce in the maritime industry.

The respondents represented seafarers working on different types of vessels. Of these, 48% were on offshore structures; 27% were on general cargo ships; 16% were bulk carriers and container ships, while 9% were on passenger ships. They include all aspects of maritime work-from captain, chief officer, and deck officer to engineer, electro-technical officer (ETO), and rating. The range of seafarer experience was also very broad-from less than three years to more than 20 years-in order to capture a good cross-section of the profession within the maritime industry.

Many participants were employed by both domestic and international shipping companies, enhancing the generalizability of the findings.

Under three major environments are classified the influences of psychological security:

- Family characteristics that comprised marital status, parenthood, and frequency of communication with family members
- Colleagues' environment: characterized by social interaction with crew members and the diversity of crew nationalities, and hierarchical relationships on board
- Work environment: type of vessel, food service quality, rest hours, nature of work, frequency of crew change, salary satisfaction, workout habits, and work area (deck vs. engine room).

Much of the previous research has focused on psychological safety in the leadership and operational environment; however, very few studies have dealt with the direct implications of the workplace on psychological security among seafarers. Given that maritime work is isolated and structured, factors such as crew dynamics, job satisfaction, rest hours, and recreational activities

are vital to understand the mental well-being and overall psychological security of seafarers. Our research, therefore, provides a systematic analysis of how these environmental factors contribute to psychological security and attempts to fill gaps in the existing literature.

This study, while investigating these environments alone, does not rule out the fact that there may be interactions between the two. More research can be built on this groundwork through moderation and mediation models like Structural Equation Modelling (SEM) to figure out how these aspects interact to affect seafarers' psychological security.

The participants were fully briefed on the nature and purpose of the study before the consent form was signed for participation. Figure 2 provides a model research framework to better understand the environmental effects on seafarers' psychological security.

Development of Psychological Security Scale (PSS) for seafarers:

Although different aspects of psychological security have been addressed by earlier researchers, we adopt the dimensions of Maslow and Maslow's S-I Inventory for this particular study. In this regard, the items of Maslow's Scale have been developed, and instead of self-report questions, we have been able to prepare a behaviourally anchored scale for clarity and consistency of responses. The intended variability in interpretation for each of the response options we piloted involving 20 seafarers with expert evaluators for further refinement of the wording toward accuracy. Coastwise psychologists further reviewed the scale to ensure its applicability and reliability in the seafaring setting.

The scale contains 30 behavioural attitudes, each of which has three distinct alternatives representing different levels of psychological safety. To illustrate, consider the attitude "Feeling secure," which corresponds to Attitude No. 7 in Table 1. The three alternatives speaking to this attitude would be: "Constant danger," "Unsafe in crises," and "Constantly secure," representing low, moderate, and high levels of psychological security, respectively, with the wording designed to correspond to realities as experienced by seafarers. This structured approach will allow an understanding of psychological security among seafarers without introducing considerable inconsistencies in interpretation of responses. The entire list of the attitudes and alternatives is represented in Table 1.

Table 1: Behavioural Attitudes for Psychological Security Scale for Seafarers

No.	Behavioural Attitude	Alternative 1	Alternative 2	Alternative 3
1	Response to Insult	High concern	Slight concern	Assured
2	Interaction during Rest	Non-interactive	Harmonious	Solitary
3	Teamwork Experience	Deeply friendly	Slightly friendly	Burdensome
4	Future Work Prospects	High concern	Slight worry	Secure
5	Boss Interaction	Little interest	Full attention	Unimportant
6	Joining New Ship	Highly accepted	Slightly accepted	Unaccepted
7	Feeling secure	Constant danger	Unsafe in crises	Constant secure

No.	Behavioural Attitude	Alternative 1	Alternative 2	Alternative 3
8	Crew Affiliation	Slight belonging	Strong belonging	No affiliation
9	Conflict Resolution	Highly understood	Slightly understood	Misunderstood
10	Handling Mistakes	High fear	Slight fear	Reassured
11	Crew Relationships	Superficial	Good	Bad
12	Reaction to Failure	Optimistic	Accepting	Self-pity
13	Social Dynamics	Constant threat	Fluctuating	Safe
14	Staff Discussions	Marginalized	Important	Stranger
15	Opinion Reception	Highly liked	Disliked	Mocked
16	Solitude on Ship	Unjustified fear	Slight fear	Reassured
17	Collaborative Tasks	Uncomfortable	Harmonious	Solitary
18	Urgent request refused	Sympathetic	Slightly upset	Hated
19	Long-term Onboard	Unlimited pressure	Bearable pressure	Comfortable
20	Emergency Response	Slight support	Full support	Medical help
21	Personal Crisis Response	Huge sympathy	Slight sympathy	No sympathy
22	Crisis Management	Panicked	Fearful	Reassuring
23	Colleague's Health Issue	Indifferent	Missed	Wished departure
24	Caring for colleagues	Enough attention	A little attention	Careless
25	Piracy Incident	Panicked	Fearful	Reassuring
26	Hearing Negative Gossip	Annoyed, passive	Annoyed, active	Indifferent
27	Delivering Bad News	Gradual, supportive	Gentle	Indifferent
28	Harassment Incident	Fearful, escapist	Fearful, self-protective	Anxious, self-protective
29	Multinational Crew	Incompatible	Understanding	Racialized
30	Bullying Experience	Upset, resilient	Ridiculed by one	Ridiculed by all

The behavioural attitudes are grouped into three scale dimensions: the need for safety, the need to belong, and the need for affection. These dimensions are derived from Maslow's hierarchy of needs and are central to our understanding of psychological security among seafarers. The behavioural attitudes are varying between receiving or providing love, security and belonging, the distribution of scores among the alternatives of attitudes and their corresponding scale dimensions are presented in Table 2.

Table 2: Distribution of Scores Among the Alternatives of Attitudes and Corresponding Scale Dimensions

Scale dimensions	Attitudes number	Distribution of scores among the alternatives of Attitudes
The need for safety	1- 4- 7- 10- 13- 16- 19- 22- 25- 28	**1- 2- 3**
The need to belong	2- 5- 8- 11- 14- 17- 20- 23- 26- 29	**2- 3- 1**
The need for affection	3- 6- 9- 12- 15- 18- 21- 24- 27- 30	**3- 2- 1**

The total scores of the scale are calculated from the sum of scores on 30 behavioural attitudes, with the maximum possible score being 90 and the lowest one being 30. A high total score indicates high psychological security and vice versa. The distribution of scores on behavioural attitudes' alternatives are shown in Table.

Table 3: Numerical rating for alternatives of Attitudes

Numerical rating	Verbal judgement of alternatives of Attitudes
1	**The Lowest level of psychological security**
2	**An average level of psychological security**
3	**The highest level of psychological security**

In addition to the 30 behavioural attitudes, the scale also includes socio-demographic questions about various aspects of the seafarers' personal and professional life. The scale was evaluated and verified rigorously through pilot testing before the final survey was developed. This process involved feedback from 20 seafarers and a group of academic experts, which was used to refine the questions and develop the final scale.

Validity and reliability of the developed Psychological Security Scale:

Cronbach's alpha coefficient, often denoted as "α", is a widely used statistical measure to determine the internal consistency or reliability of a test or scale. It provides a measure of how well the items in a set are positively correlated to one another. The coefficient values range between 0 and 1, with values closer to 1 indicating higher reliability. Typically, an alpha of 0.7 or above is considered acceptable, though this can vary depending on the field of study (Tavakol & Dennick, 2011).

For the Psychological Security Scale tailored for seafarers, the Cronbach's α coefficient was utilized to evaluate the scale's reliability. The derived Cronbach's α value was 0.788, indicating satisfactory overall reliability. Further scrutiny revealed that excluding any item, barring item (28), would decrease the scale's reliability. Omitting item (28) adjusted the Cronbach's α coefficient to 0.792, leading to its removal and retaining 29 behavioural attitudes in the scale.

Items numbered (9, 11, 12, 23, 25, 26) were discerned as low-discrimination items, having a discrimination value below 0.2, and were thus excluded, resulting in a set of 23 behavioural

attitudes. An extreme group test, involving the top and bottom 27% of total scores, was executed. An independent sample t-test applied to these groups yielded a significance of P= 0.01, indicating the scale's efficacy in distinguishing between varying levels of psychological security. The scale's validity was further verified using Confirmatory Factor Analysis, with the results tabulated in Table 2.

Table 2: Confirmatory Factor Analysis results

Model	X2	df	P	GFI	AGFI	CFI	NFI	TLI	IFI	RMSEA
Psychological security	3.587	2	.166	.990	.971	.991	.980	.987	.991	.057
Assessment	Great			Great	Great	Great	Great	Great	Great	Good

The fit results for the psychological security model were exemplary. The P value for X2 indicates the model's goodness of fit, with a non-significant value suggesting a good fit. GFI (Goodness of Fit Index), AGFI (Adjusted Goodness of Fit Index), CFI (Comparative Fit Index), NFI (Normed Fit Index), TLI (Tucker-Lewis Index), and IFI (Incremental Fit Index) are fit indices, with values closer to 1 indicating a better fit. The RMSEA (Root Mean Square Error of Approximation) value measures the model's error, with values below 0.1 indicating a good fit. These metrics collectively suggest that the data aligns well with the proposed model.

Moreover, the standardized path diagram is provided in Figure 11. the statistical outcomes affirm the successful development of a novel measure of psychological security rooted in Maslow's theory. This measure emphasizes behavioural attitudes over self-reporting and is tailored to the unique nature of seafarers' work. After rigorous reliability and validity checks, the finalized scale comprises 23 behavioural attitudes to gauge psychological security among seafarers Appendix 2.

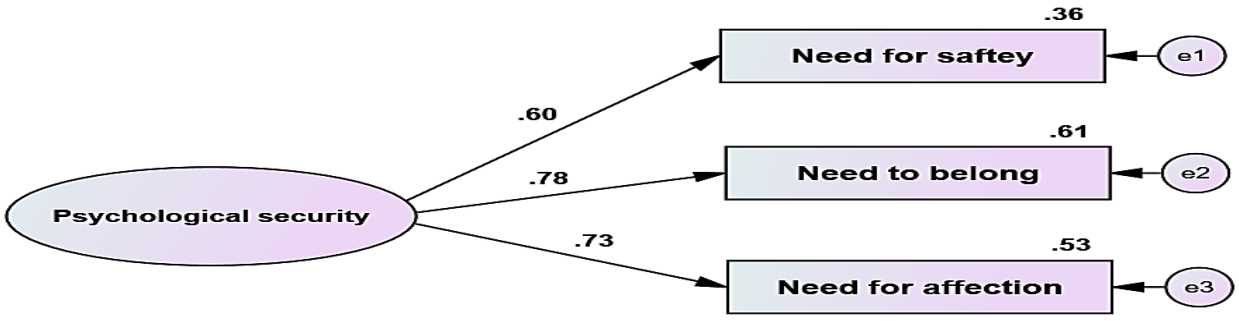

Figure 11: standardized path diagram for psychological security model.

Results

Statistical Analysis

All computations were carried out using SPSS V.28. To examine for differences in psychological security, Independent-Sample T-Tests were used for comparisons between two independent groups, for example, gender and the absence or presence of chronic disease. Comparisons of three or more groups were done using One-Way Analysis of Variance (One-Way ANOVA) to determine significant differences among several categorical variables such as age groups, levels of

experience, and types of vessels. In addition, a Hierarchical Multiple Regression was used to analyze the proportion of the variance (R^2) in psychological security accounted for by family-related variables, colleagues' environment, and work environment variables. This multi-level process ensured that both direct effects and total accumulation contributions of the predictor variables were assessed systematically.

Associations between Demographic Characteristics and Psychological Security

The study encompassed 248 Egyptian seafarers, representing a diverse range of positions, experience levels, and vessel types. A detailed breakdown of the seafarers' characteristics can be found in Appendix **1**. To discern differences across variable groups, Independent-sample t-tests and ANOVA were utilized. The findings, as presented at Table 3 revealed significant disparities in psychological security among seafarers based on several factors: communication with family (t= 9.469, P<.001), intra-crew social communication (t= 6.084, P= .003), crew nationality (t= 1.858, P= .032), work area (t= 2.717, P= .004), quality of food service (t=17.599, P<.001), rest periods (t= 8.674, P<.001), adherence to crew change schedules (t=2.020, P= .022), satisfaction with salary (t= 3.712, P<.001), and engagement in workouts (t=5.052, P<.001).

Table 3:Demographic variables by psychological security (n=248)

Variable		n	Mean	SD	T/ F	P- value
Age	less than 30 years	46	60.42	4.497	1.894	.131
	30- 40 years	133	59.15	5.438		
	40- 50 years	60	60.89	4.996		
	more than 50 years	9	60.51	3.804		
Gender	Males	238	59.85	5.222	.084	.466
	Females	10	59.99	3.130		
Years of experience	less than 3 years	24	58.63	5.468	1.661	.176
	3- 9 years	87	59.20	5.559		
	9- 15 years	57	60.71	4.537		
	more than 15 years	80	60.32	4.932		
Academic study	Vocational	119	60.55	4.881	2.704	.069
	Bachelor	111	59.40	5.413		
	Postgraduate	18	58.02	4.693		
Suffering from diseases	Yes	10	59.91	6.179	.036	.485
	No	238	59.85	5.118		
Marital status	Married	187	59.76	5.260	.481	.619
	Single	58	60.27	4.710		
	Divorced	3	57.71	7.567		
Having kids	Yes	174	59.86	5.067	.011	.495
	No	74	59.85	5.376		
Communication level with	Weak	28	56.33	5.505	9.469	<.001
	Moderate	165	59.96	5.045		

Variable		n	Mean	SD	T/ F	P- value
family	Strong	55	61.33	4.491		
Social communication between crew	Weak	120	58.99	5.160	6.084	.003***
	Moderate	11	57.29	7.062		
	Strong	117	60.98	4.710		
Crew nationality	Same nationalities	77	60.75	5.154	1.858	.032**
	Different nationalities	171	59.45	5.111		
Position	Captains	29	59.35	5.584	1.878	.074
	Chief officer	17	58.25	5.286		
	Second officer	31	59.01	6.603		
	Third officer	8	55.46	8.106		
	Chief engineer	11	59.54	4.383		
	Second engineer	42	60.00	5.214		
	Third engineer	89	60.97	3.893		
	ETO	21	59.93	4.908		
Work area	Deck crew	85	58.64	6.163	2.717	.004***
	Engine room	163	60.49	4.423		
Type of vessel	offshore	120	59.94	5.223	.174	.914
	general cargo	66	59.72	5.514		
	bulk- RoRo- container	39	60.16	4.173		
	Passengers	23	59.26	5.443		
Food service	Good	175	60.97	4.623	17.599	<.001
	Moderate	63	57.58	5.004		
	Bad	10	54.58	7.121		
Rest hours	More than 12 hours	36	61.88	3.354	8.674	<.001
	12 hours	133	60.36	4.985		
	Less than 12 hours	79	58.07	5.598		
Work nature	Physical work	35	61.56	4.211	2.262	.106
	Paperwork	10	59.38	5.440		
	Both	203	59.58	5.248		
scheduled crew change	Yes	159	60.35	4.965	2.020	.022**
	No	89	58.98	5.382		
Salary satisfaction	Yes	150	60.81	4.275	3.712	<.001
	No	98	58.39	5.990		
Doing workouts	Yes	126	61.40	3.654	5.052	<.001
	No	122	58.25	5.938		

Results point out that there are differences in the level of psychological security due to the level of communication between the family in Favor of those with strong communication with their families (M= 61.33 / SD= 4.491) and there are differences due to the level of communication

between crew in favour of those with the strong communication (M= 60.98 / SD= 4.710) as detailed in Table 3 and Figure 12.

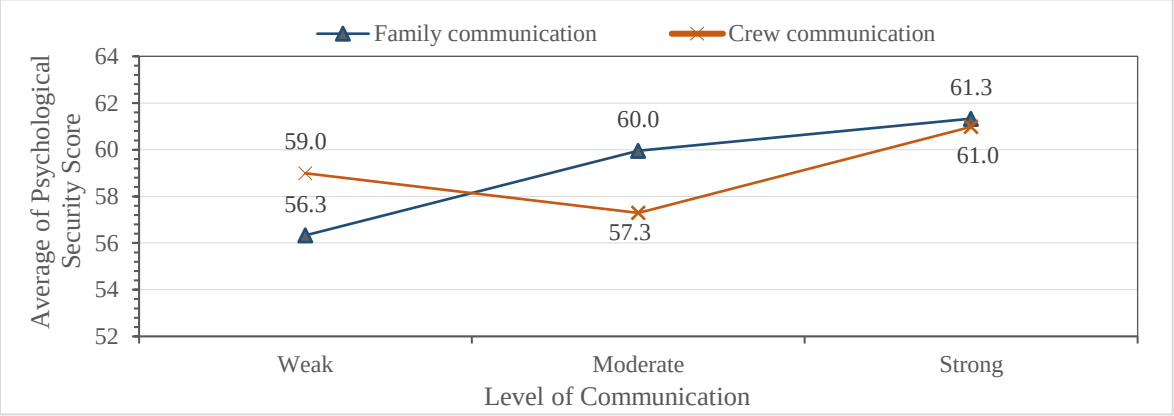

Figure 12: Average Psychological Security Score according to family and crew level of communication

Also, the result showed that there are differences according to food service in favour of those who have a good food service (M= 60.97/ SD= 4.623), and there are differences according to rest hours in favour of those who have more than 12 hours for rest (M= 61.88/ SD= 3.354) Table 3 & Figure 13. We can also see that there are differences according to crew nationality in favour of those who have worked with crew from the same nationality (M= 60.75, SD= 5.154), Also, seafarers who worked at engine room have a high level of psychological security than deck crew (M= 60.49, SD= 58.64) Table 3 & Figure 14. Result emphasized that there are differences between Egyptian seafarers due to crew change, salary satisfaction and doing workouts in favour of who have scheduled crew change, are satisfied about salary, and did workouts. Respectively (M= 60.35, 60.81, 61.40), (SD= 4.965, 4.275, 3.654 Table 3 & Figure 15.

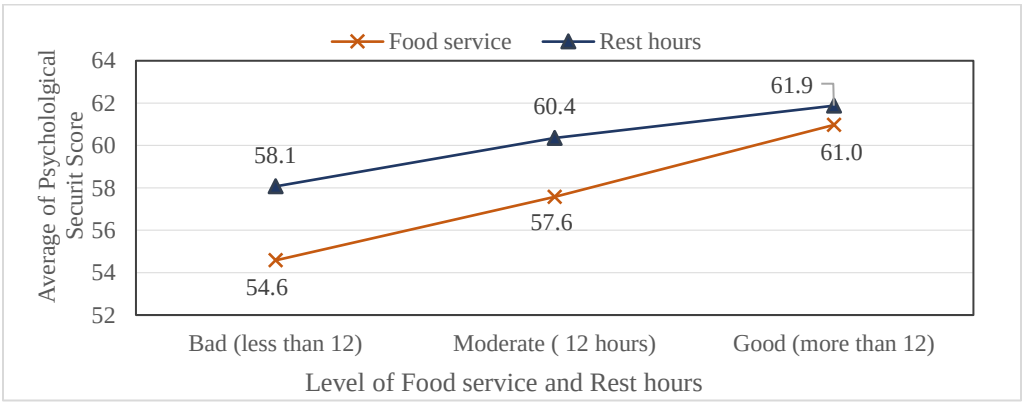

Figure 13: Psychological Security Score according to food service quality and rest hours

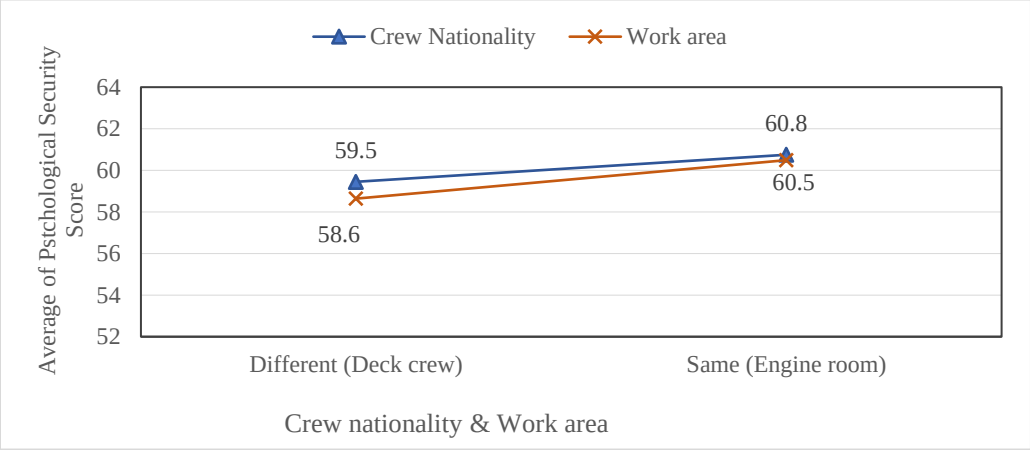

Figure 14: Psychological Security Score according to crew nationality & work area.

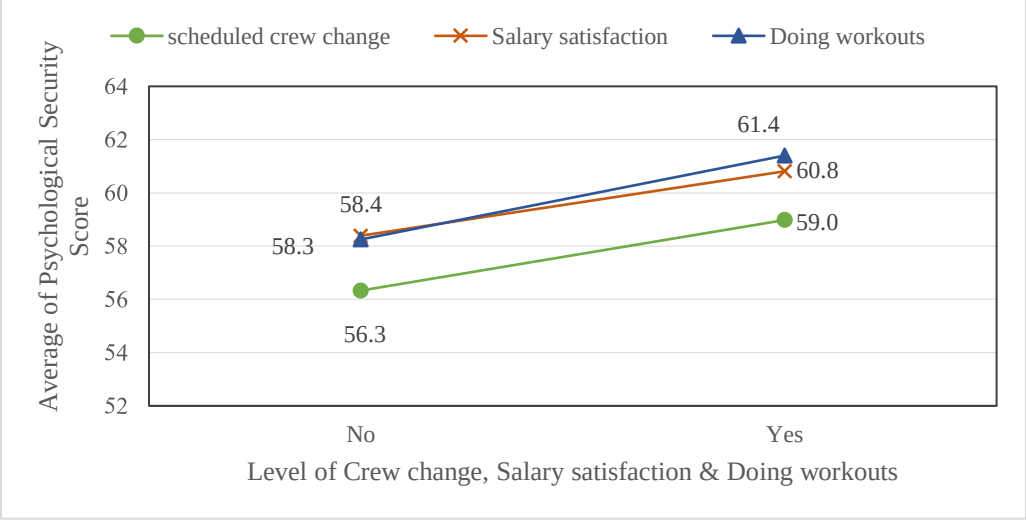

Figure 15: Psychological Security Score according to crew change, salary satisfaction and doing workouts.

Hierarchical multiple regression Models

Hierarchical multiple regression explored how much of the variance in psychological security among seafarers could be accounted for by demographic variables in 3 main fields (family characteristics, colleagues' environment and work environment). Because all the demographic variables in this study are nominal variables, we set it as a dummy variable to ensure the accuracy of analysis. In model one (step 1), the significant demographic factors from family characteristics added as a predictor included (communication level with family). The second model consisted of the variables in Model 1, plus colleagues' environment. Significant factors added as a predictor included (social communication between crew and crew nationality). The third model consisted of the variables in Model 1, 2 plus significant work environment. Factors were entered as predictors which included (work area, food service, rest hours, scheduled crew change, salary satisfaction and doing workouts).

Table 4: Hierarchical multiple regression analysis for demographic variables in predicting psychological security (n = 248).

Variable		Model 1 (family characteristics)			Model 2 (colleagues' environment)			Model 3 (work environment)		
		B	SE	B	B	SE	β	B	SE	β
communication with family	Strong	5.004***	1.157	.404	4.353***	1.178	.352	1.944	1.163	.157
	moderate	3.632***	1.018	.333	3.584***	1.007	.329	1.790	.983	.164
	Weak (ref)									
social communication between crew	Strong				1.582**	.669	.154	.676*	.638	.066
	moderate				-.840	1.560	-.034	-.613	1.451	-.025
	Weak (ref)									
crew nationality	Same nationality				1.233	.679	.111	1.831***	.642	.165
	Different nationalities (ref)									
work area	Engine room							1.791***	.622	.165
	Deck crew (ref)									
food service	Good							4.050*	1.581	.359
	moderate							2.187	1.592	.185
	Bad (ref)									
rest hours	>12 hours							.897*	.677	.087
	12 hours							1.938	.956	.133
	< 12 hours (ref)									
scheduled crew change	Yes							.324	.627	.030
	No (ref)									
salary satisfaction	Yes							.709	.636	.067
	No (ref)									
doing workouts	Yes							2.026***	.633	.197
	No (ref)									
Constant		56.333			55.417			50.359		
R2		.072			.112			.277		
Adjusted R2		.064			.094			.236		
F/ P- value		9.469/ <.001			6.107/ <.001			6.885/ <.001		

Hierarchical multiple regression results showed that work environment factors combined with colleagues' environment explained 28% of the variance (R2= .277, p < .001) in psychological security, while colleagues' environment combined with family characteristics explained 11 % of the variance (R2= .112, p < .001), and only family characteristics explained 7 % of the variance (R2= .072, p < .001) in psychological security Table 4 & Figure 16

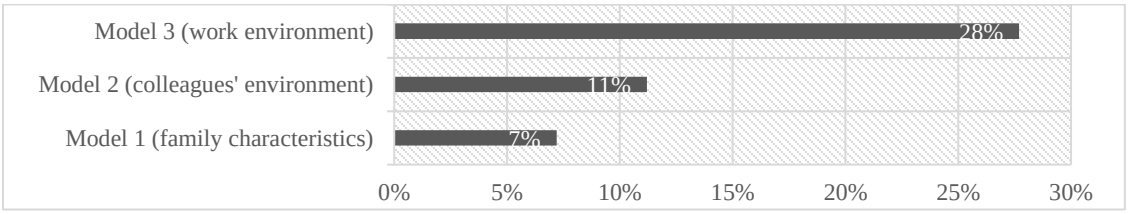

Figure 16: Variance percentage in psychological security according to the three models

In model one, all predictors were statistically significant, compared to seafarers who have weak communication with family. Those who have strong/ moderate communication reported significant psychological security (B= 5.004/ B= 3.632, p <.001) Table 4. This indicates that an increase by one unit in the level of communication with family leads to an increase in the psychological security rate of seafarers by a rate of (5) units. In model two, all predictors were statistically significant except crew nationalities, compared to seafarers who have weak social communication between crew. Those who have strong social communication reported significant psychological security (B= 1.582, p <.001), while the B coefficient for those who have moderate social communication did not reach conventional levels of statistical significance (B = -.840, p = 0.722) Table 4. This indicates that an increase by one unit in the level of strong social communication between crew leads to an increase in the psychological security rate of seafarers by a rate of (1.6) units. In model three, all predictors were statistically significant except scheduled crew change and salary satisfaction, Model 3 also showed that crew nationality was added while the relationship of family's communication with psychological security was eliminated when work environment's factors are included in the model, suggesting. that the variance in psychological security is better explained by work environment's and colleague's factors together than family characteristics as it one.

By looking at model three, compared with seafarers who worked at deck crew, those who have worked at engine room reported significant psychological security (B= 1.791, p <.001). Compared with seafarers who have bad food service, seafarers who have good food service reported significant psychological security (B= 4.050, p <.05), while the B coefficient for those who have moderate food service did not reach conventional levels of statistical significance (B = 2.187, p = 0.171). This indicates that an increase by one unit in the level of good food service leads to an increase in the psychological security rate of seafarers by a rate of (4) units. Also, compared with seafarers who have less than 12 hours for rest, seafarers who took more than 12 hours reported significant psychological security (B= .897, p <.05), while the B coefficient for those who have 12 hours did not reach conventional levels of statistical significance (B = 1.938, p = 0.186). This indicates that an increase by one unit in the level of rest hours (more than 12 hours) leads to an

increase in the psychological security rate of seafarers by a rate of (.90) units. Finally, by comparing, seafarers who did not do workouts, those who did it (B = 2.026, p <.001), This indicates that an increase by one unit in the level of workouts leads to an increase in the psychological security rate of seafarers by a rate of (2) units Table 4.

Discussion

To the best of the authors' knowledge, this is the first study addressing seafarers' psychological security in a quantified manner. The developed scale was applied to a group of Egyptian seafarers to validate it. In this context, the study explored the level of psychological security, examining the influence of personal, family characteristics, colleagues', and work environment factors. Through hierarchical regression analysis, significant contributors were identified among this specific group, such as communication with family, social interaction among crew, crew nationality, work area, food service, rest hours, and participation in workouts as shown in Table 4. The results revealed that work and colleagues' environment factors collectively explained 28% of the variance in psychological security, as detailed in Figure 16. & Table 4 Interestingly, within this context, the importance of family communication as a predictor diminished when factors related to work conditions were introduced into the model. This insight suggests that enhancing social communication among seafarers and improving work conditions could meaningfully increase their level of psychological security. The study thus offers a nuanced understanding of psychological security among Egyptian seafarers and highlights the integral role of work and social environments in shaping it.

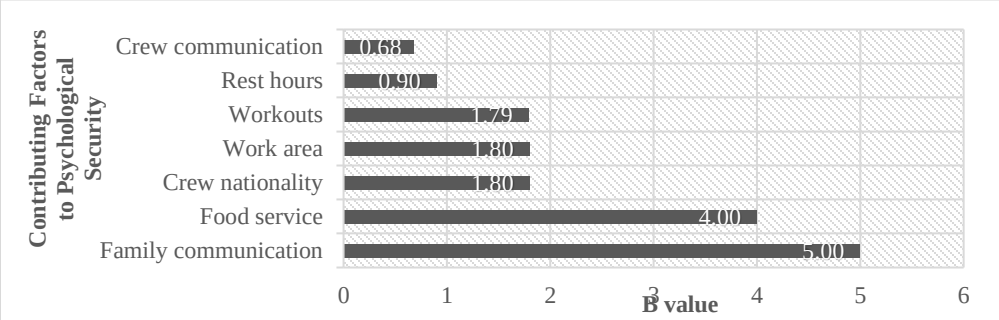

Figure 17: Statistically significant contributing factors to psychological security.

This result seems logical to a large extent, as the surrounding conditions are greatly reflected on the psychological aspect of the individual. So, whenever the working conditions are appropriate and satisfactory to the seafarer, this is reflected in his sense of psychological security and psychological well-being in general and on his performance at work. Also, social communication supports the individual's sense of belonging to the individuals with whom he works and to the place in which he works, considering that the working conditions of seafarers make them spend a long time on the ship, which may be much more than the period they spend with their families. This explains why the work environment and colleagues gain greater importance in interpreting psychological security when linked to communication with the family.

Egyptian Seafarers in this study achieved a moderate level of psychological security regarding to the higher level of psychological security among our participants, who have good food service, have more than 12 hours for rest Table 3 & Figure 13. Also, those who have a scheduled crew change, have a satisfaction for salary and doing workouts as an activity, Table 3 & Figure 15. That is agreed with the main purpose of Maslow (1943b) theory of needs, he Emphasize the importance of meeting physiological needs first including having enough food, sleep, so that the individual can think of higher needs and satisfy them such as need for security. Also, Taormina & Gao (2013) pointed out that meeting the physiological needs of the individuals enables them to feel secure and magnifying the feeling of emotional/psychological security. And as Taormina & Sun (2015) mentioned "The more Physiological Needs Satisfaction people have, the less Psychological Insecurity they will have".

the International Committee on Seafarer's Welfare, in the Seafarer's Health Information Programme, sponsored by the ITF Seafarer's Trust referred to some guidelines for mental care onboard Ships which included the quality of rest periods, adequate time for uninterrupted rest and leisure activities on-board as cited in (Menon, 2011)

Current results point us to that seafarers who have strong communication with their families have a higher level of psychological security than others and seafarers who have strong social communication with their crew have a higher level of psychological security than Table 3 & Figure 12 and that is in line with Maslow et al.(1945b) who emphasized that receiving support from co-workers helps reduce feelings of insecurity, referring to the importance of the role of colleagues in achieving a high level of psychological security. Despite the harsh working conditions inside the engine room, they showed a high level of psychological security Table 3 & Figure 14 compared to deck crew. we suggest that the reason for that is most of participants in this study are working at offshore structure in which the big load is on the deck crew while the engine room is auxiliary machinery. Seafarers who worked with crew from the same nationality reported ahigh level of psychological security Table 3 & Figure 14. We attribute this to the fact that working with people from the same nationalities makes the seafarer feel at home and enrich the feeling of belonging which reduces the impact of the long time he spends at sea and reduces the alienation felt by seafarer.

The findings of this study, while insightful, are subject to certain limitations. The reliance on a sample of Egyptian seafarers may restrict the generalizability of the results to other populations. Despite efforts to include a diverse sample, the gender imbalance and specific characteristics of the sample may have influenced the findings. Additionally, while the study identified three main environments affecting psychological security, other factors and environments may exist that were not explored in this research.

However, it's essential to recognize that the primary objective of this study was to validate the newly developed scale for assessing psychological security among seafarers. The methodology and the novel scale have shown promise, and the authors are confident that with more diverse and extensive data, more generalized results can be obtained. Future research should consider

employing mixed methodologies for in-depth analysis and expanding the sample to different nationalities and characteristics.

These limitations do not diminish the study's contributions but rather guide future research directions. The study serves as a preliminary step in a vital area that has not been extensively explored, laying the groundwork for further investigation and refinement of the methodology.

Conclusion

This research offers insights into the psychological security of seafarers, with a particular focus on Egyptian seafarers. The findings underscore the significance of colleagues' and work environment factors as key determinants of psychological security. Furthermore, the study validates the newly developed psychological security scale as an effective tool for assessing seafarers' mental well-being.

Given the pivotal role of psychological security in maritime work, future research should delve into strategies for bolstering seafarers' psychological resilience, especially during challenging periods onboard. Investigating the psychological aftermath of maritime incidents could also be enlightening. Expanding this line of inquiry to diverse samples and exploring its interplay with other maritime-related variables would further enrich our understanding.

The study advocates for the integration of psychological assessments in seafarers' training programs, given their profound impact on maritime performance. Periodic monitoring of seafarers' mental health and consistent psychological support are also recommended.

In sum, the psychological security of Egyptian seafarers warrants significant attention. While the findings are illuminating, the specific characteristics of the sample used necessitate caution in generalizing the results. Broader applications to varied samples are likely to yield more encompassing insights. The study also suggests a more granular exploration of the three studied environments, possibly integrating mixed methodologies. Notably, there remains a gap in literature concerning seafarers' psychological security, presenting ample opportunities for further research.

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Appendix 1: characteristics of participants:

	Variable	Category	N (%)	Variable	Category	N (%)
Personal characteristics	Age	less than 30 years	46 (18.5 %)	Years of experience	less than 3 years	24 (9.7 %)
		30- 40 years	133 (53.6 %)		3- 9 years	87 (35.1 %)
		40- 50 years	60 (24.2 %)		9- 15 years	57 (23 %)
		more than 50 years	9 (3.6 %)		more than 15 years	80 (32.2 %)
	Gender	Males	238 (96 %)	Suffering from diseases	Yes	10 (4 %)
		Females	10 (4 %)		No	238 (96 %)
	Academic study	high School (precollege)	119 (48 %)			
		Bachelor's	111 (44.2 %)			
		Master's/ Ph.D. (postgraduate)	18 (7.3 %)			
Family characteristics	Marital status	Married	187 (75.4 %)	Communication level with family	Weak	28 (11.3 %)
		Single	58 (23.4 %)		moderate	165 (66.5 %)
		Divorced	3 (1.2 %)		Strong	55 (22.2 %)
	Having kids	Yes	174 (70.2 %)			
		No	74 (29.8 %)			
colleagues Environment	Social communication between crew	Weak	120 (48.4 %)	Position	Chief engineer	11 (4.4 %)
		Moderate	11 (4.4 %)			
		Strong	117 (47.2 %)			
	Crew nationality	Same nationalities	77 (31 %)			
		Different nationalities	171 (69 %)			
	Position	Captains	29 (11,7 %)			
		Chief officer	17 (6.9 %)		Second engineer	42 (16.9 %)
		Second officer	31 (12.5 %)		Third	89 (35.9

Variable	Category	N (%)	Variable	Category	N (%)
				engineer	%)
	Third officer	8 (3.2 %)		ETO	21 (8.5 %)
Work Environment	Type of vessel	offshore structure or vessel	120 (48.4 %)	Food service	Good	175 (70.6 %)
		general cargo	66 (26.6 %)		moderate	63 (25.4 %)
		bulk- RoRo-container	39 (15.7 %)		Bad	10 (4 %)
		Passengers	23 (9.3 %)			
	Rest hours	More than 12 hours	36 (14.5 %)	Work nature	Physical work	35 (14.1 %)
		12 hours	133 (53.6 %)		Paperwork	10 (4 %)
		Less than 12 hours	79 (31.9 %)		Both	203 (81.9 %)
	Existence of scheduled crew change	Yes	159 (64.1 %)	Doing workouts	Yes	126 (50.8 %)
		No	89 (35.9 %)		No	122 (49.2 %)
	Salary satisfaction	Yes	150 (60.5 %)	Work area	Deck crew	85 (34.3 %)
		No	98 (39.5 %)		Engine room	163 (65.7 %)

Appendix 2: psychological security scale:

Behavioural Attitudes		Scale dimensions	Distribution of scores
Response to Insult	If you were insulted by a colleague on board... I am very concerned that this could happen again. I am slightly concerned that this might happen again. Rest assured that this will not happen again.	need for safety	1- 2- 3
Interaction during Rest	When the rest time comes after working hours... I sit with my colleagues but do not interact	need to belong	2- 3- 1

	Behavioural Attitudes	Scale dimensions	Distribution of scores
	with them. I sit with my colleagues in harmony with them. I prefer to sit alone because I feel alienated.		
Teamwork Experience	When you work in a team... I feel deeply friendly by others. I feel a little friendly from others. I feel like a burden to others.	need for affection	3- 2- 1
Future Work Prospects	When you think about the nature of your work... I am very concerned about my future. I have a slight worry about my future. I feel secure about my future.	need for safety	1- 2- 3
Boss Interaction	While talking to your boss... I feel little interest from him. I feel complete attention from him. I feel like an unimportant member of the team.	need to belong	2- 3- 1
Joining New Ship	When you join a new ship for the first time... I feel very accepted by the crew. I feel a little accepted by them. I feel unaccepted.	need for affection	3- 2- 1
Feeling secure	While on board the ship... I feel like my life is in danger all the time. I feel dangerous only when in critical situations. I feel constantly safe while at work.	need for safety	1- 2- 3
Crew Affiliation	With reference to teamwork among your ship's crew... I feel a little bit of a sense of belonging towards them. I feel a huge sense of belonging to my crew. I have no affiliation with this crew.	need to belong	2- 3- 1

Behavioural Attitudes		Scale dimensions	Distribution of scores
Handling Mistakes	If you make an unintentional mistake in your work... I am very afraid of what will happen to me. I have a slight fear of the consequences of things. I feel reassured that I will take my right as it should	need for safety	1- 2- 3
Social Dynamics	when you deal with others... I feel threatened all the time by them. My feelings fluctuate between threat and reassurance. I feel safe when dealing with them.	need for safety	1- 2- 3
Staff Discussions	When you discuss with your staff about a topic... I feel marginalized by them. I feel like an important part of the team. I feel like a stranger to them.	need to belong	2- 3- 1
Opinion Reception	When you express your opinions to those around you... I feel they like my opinions very much. I feel like they didn't like my views. I feel they are making fun of my views.	need for affection	3- 2- 1
Solitude on Ship	If you are alone in one of the places on the ship... I feel very unjustified fear. I feel a slight fear. I feel reassured.	need for safety	1- 2- 3
Collaborative Tasks	If you are asked to perform a task in collaboration with another colleague.... I was forced to accept, not feeling comfortable. I accept because I get along easily with others. I refuse, preferring to work alone.	need to belong	2- 3- 1
Urgent request refused	your boss refused to give you a much-needed vacation... I feel his sympathy, trying to understand his attitude.	need for affection	3- 2- 1

	Behavioural Attitudes	Scale dimensions	Distribution of scores
	I only feel bad for a little while. I feel like I'm being hated, taking bad action.		
Long-term Onboard	When you are on board the ship for a long time..... I feel unlimited pressure. I feel bearable pressure. I feel comfortable all time.	need for safety	1- 2- 3
Emergency Response	If a difficult situation happens to you on board the ship such as (accident- injury- illness) ... I get simple support from just some. I get fully support from everyone. I only get help from medical staff.	need to belong	2- 3- 1
Personal Crisis Response	You heard the news of death/ illness one of your relatives while you were on board the ship... I find huge sympathy from my crew. I find little sympathy with me. I find no sympathy from those around me.	need for affection	3- 2- 1
Crisis Management	22 If an emergency case occurred on board, such as (Fire- Flooding- Pollution- Collision), and you find your crew panicking... I feel very panicked with them, which makes it worse. I am overcome with fear, and it is difficult for me to try to calm them down. I show calm to my crew, spreading reassurance among them.	need for safety	1- 2- 3
Caring for colleagues	If you find a member of your crew introverted... I'm giving him enough attention to get over it. I'm trying to give him a little bit of attention. I don't care about him, even if his condition gets worse	need for affection	3- 2- 1
Delivering Bad News	If you are tasked with communicating a bad decision to your crew members... Tell them gradually while providing them	need for affection	3- 2- 1

Behavioural Attitudes		Scale dimensions	Distribution of scores
	with all the necessary support. Just tell them in a nice way to make things easier for them. Tell them without caring about their feelings.		
Multinational Crew	If you work with a crew consisting of different nationalities... I feel incompatible with them. I feel a good understanding with them. I feel racialized by them all the time.	need to belong	2- 3- 1
Bullying Experience	If you have been bullied by a member of your crew... I feel upset, but I don't let it affect me. I just feel like I'm being ridiculed by this person. I feel ridiculed by all the crew.	need for affection	3- 2- 1